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(54) Title: ENVIRONMENTAL SEM WITH MULTIPOLE FIELDS FOR IMPROVED SECONDARY ELECTRON DETECTION

## (57) Abstract

Amplification of the current of secondary electrons emanating from the specimen (14) is realized in an ESEM by avalanche-like ionization of the molecules (41) of the gas atmosphere. However, in order to achieve an adequate number of successive ionizations, a comparatively high value of the electric field at the detector electrode (46) is required and, because of the risk of electric breakdown, the distance between the specimen and the detector electrode may not be smaller than a comparatively large minimum distance. The number of successive ionizations, and hence the current amplification, is thus limited. The invention proposes to configure the electric field of the detector (46, 50), co-operating with the magnetic field (52) of the immersion lens (8) already present in the ionization space, as an electric multipole field. In the case of electric multipoles, at a given field strength on the optical axis the electric field strength outside the optical axis may be substantially higher. Thus, while influencing the primary electron beam slightly only, a strong detector field can be provided so that the secondary electrons to be accelerated receive adequate energy to realize numerous multipole ionizations, and hence a high current amplification in the gas atmosphere around the specimen.

